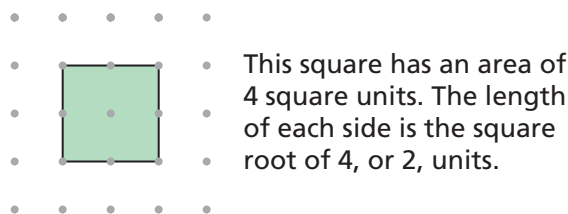


2.2 Square Roots

The area of a square is the length of a side multiplied by itself. This can be expressed by the formula $A = s \cdot s$, or $A = s^2$.

If you know the area of a square, you can work backward to find the length of a side. For example, suppose a square has an area of 4 square units. To find the length of a side, you need to figure out what positive number multiplied by itself equals 4. Because $2 \cdot 2 = 4$, the side length is 2 units. We call 2 a **square root** of 4.



In general, if $A = s^2$, then s is a square root of A . Because $2 \cdot 2 = 4$ and $-2 \cdot -2 = 4$, 2 and -2 are both square roots of 4. Every positive number has two square roots. The number 0 has only one square root, 0.

If N is a positive number, then \sqrt{N} indicates the positive square root of N . For example, $\sqrt{4} = 2$. The negative square root of 4 is $-\sqrt{4} = -2$.

If the area of a square is known, then square roots can be used to describe the length of a side of the square.

Getting Ready for Problem 2.2

- What is the side length of a square with an area of 2 square units?
- Is this length greater than 1? Is it greater than 2?
- Is 1.5 a good estimate for $\sqrt{2}$?
- Can you find a better estimate for $\sqrt{2}$?



The area of a square is the side length squared.

Problem 2.2 Square Roots

In this problem, use your calculator only when the question directs you to.

- A.**
1. Find the side lengths of squares with areas of 1, 9, 16, and 25 square units.
 2. Find the values of $\sqrt{1}$, $\sqrt{9}$, $\sqrt{16}$, and $\sqrt{25}$.
- B.**
1. What is the area of a square with a side length of 12 units?
What is the area of a square with a side length of 2.5 units?
 2. Find the missing numbers.
 $\sqrt{\square} = 12$ $\sqrt{\square} = 2.5$
- C.** Refer to the square with an area of 2 square units you drew in Problem 2.1. The exact side length of this square is $\sqrt{2}$ units.
1. Estimate $\sqrt{2}$ by measuring a side of the square with a centimeter ruler.
 2. Calculate the area of the square, using your measurement from part (1). Is the result exactly equal to 2?
 3. Use the square root key on your calculator to estimate $\sqrt{2}$.
 4. How does your ruler estimate compare to your calculator estimate?
- D.**
1. Which two whole numbers is $\sqrt{5}$ between? Explain.
 2. Which whole number is closer to $\sqrt{5}$? Explain.
 3. Without using the square root key on your calculator, estimate the value of $\sqrt{5}$ to two decimal places.
- E.** Give the exact side length of each square you drew in Problem 2.1.

ACE Homework starts on page 23.